

EXHIBT 1-A

PART ~~3~~

Appendix 4: Fifteen Intelligent Design Research Themes

1. **Methods of Design Detection.** Methods of design detection are widely employed in various special sciences (e.g., archeology, cryptography, and the Search for Extraterrestrial Intelligence or SETI). Research by design theorists in this area is ongoing. William Dembski's *The Design Inference* began research in this area (see Appendix 3).
2. **Biological Information.** What is the nature of biological information? How do function and fitness relate to it? What are the obstacles that face material mechanisms in attempting to generate biological information? What are the theoretical and empirical grounds for thinking that intelligence is indispensable to the origin of biological information? Stephen Meyer's article in the *Proceedings of the Biological Society of Washington* illustrates this line of research (see Appendix 3).
3. **Evolvability.** Evolutionary biology's preferred research strategy consists in taking distinct biological systems and finding similarities that might be the result of a common evolutionary ancestor. Intelligent design, by contrast, focuses on a different strategy, namely, taking individual biological systems and perturbing them (both intelligently and randomly) to see how much the systems can evolve. Within this latter research strategy, limitations on evolvability by material mechanisms constitute evidence for design. Douglas Axe's research illustrates this research theme (see the two articles by him listed in Appendix 3).
4. **Evolutionary Computation.** Organisms employ evolutionary computation to solve many of the tasks of living (cf. the immune system in vertebrates). But does this show that organisms originate through some form of evolutionary computation (as through a Darwinian evolutionary process)? Are GPAs (General Purpose Genetic Algorithms) like the immune system designed or the result of evolutionary computation? Need these be mutually exclusive? Evolutionary computation occurs in the behavioral repertoire of organisms but is also used to account for the origination of certain features of organisms. What is the relationship between these two types of evolutionary computation as well as any design intrinsic to them? William Dembski's work in chapter 4 of *No Free Lunch* lays out some of the theoretical groundwork here. He is also one of the programmers of a computational simulation that investigates the scope and limits of evolutionary computation, namely, the MESA program (Monotonic Evolutionary Simulation Algorithm), which is additionally also due to Micah Sparacio and John Bracht. This program is available online at www.iscid.org/mesa.
5. **Technological Evolution (TRIZ).** The only well-documented example we have of the evolution of complex multipart integrated functional systems (as we see in biology) is the technological evolution of human inventions. In the second half of

the twentieth century, Russian scientists and engineers studied hundreds of thousands of patents to determine how technologies evolve. They codified their findings in a theory to which they gave the acronym TRIZ, which in English translates to Theory of Inventive Problem Solving (see Semyon Savransky, *Engineering of Creativity: Introduction to TRIZ Methodology of Inventive Problem Solving*, CRC Publishers, 2000). The picture of technological evolution that emerges out of TRIZ maps especially well onto the history of life as we see it in the fossil record and includes the following:

- New technologies (cf. major groups like phyla and classes) emerge suddenly as solutions to inventive problems. Such solutions require major conceptual leaps (i.e., design).
- Existing technologies (cf. species and genera) can, by contrast, be modified by trial-and-error tinkering (cf. Darwinian evolution), which amounts to solving routine rather than inventive problems. (The distinction between routine and inventive problems is central to TRIZ. In biology, irreducible complexity suggests one way of making the analytic cut between these types of problems. Are there other ways?)
- Technologies approach ideality (cf. local optimization by means of natural selection) and thereafter tend not to change (cf. stasis).
- New technologies, by supplanting old technologies, can upset the ideality and stasis of the old technologies, thus forcing them to evolve in new directions (requiring the solution of new inventive problems, as in an arms race) or by driving them to extinction.

Mapping TRIZ onto biological evolution provides an especially promising avenue of design-theoretic research and preserves the best in Niles Eldredge and Stephen Jay Gould's model of punctuated equilibrium.⁵⁹

6. ***Principle of Methodological Engineering.*** Evolutionary biology has lost its sense of proportion about how much evolution is possible as a result purely of blind material mechanisms (like random variation and natural selection) because it floats free of the science of engineering. At every crucial juncture where some major evolutionary transition needs to be accounted for, evolutionary biology invokes a designer-substitute (like natural selection, lateral gene transfer, or symbiogenesis) to do the necessary design work. Yet, unlike the science of engineering, evolutionary biology does not actually perform the necessary design work or specify a detailed procedure by which it might be accomplished. Intelligent design, by contrast, takes what may be called "methodological engineering" as a fundamental regulative principle for understanding biological systems. According to this principle, biological systems are to be understood, at least to a first approximation, as engineering systems. To be sure, biological systems (and humans in particular), are more than engineering systems; but they are at least that. In consequence, the origin, construction, operation, break down, wearing out, repair, and above all history of modifications (both designed and accidental) of such systems are all to be understood in engineering terms. Intelligent design promises to

inspire advanced academic programs in biotic engineering that will take over much of what is currently being taught under the rubric of evolutionary biology.

7. ***The Psychology of Design Detection.*** There is a large literature in the field of experimental psychology on human reasoning and problem solving, and specifically on humans as intuitive probabilists or statisticians.⁶⁰ One line of research suggests that humans are poor intuitive probabilists when they need to update the likelihood of events in light of competing prior probabilities without the benefit of pencil and paper—i.e., without being able to explicitly apply probability theory. Put another way, this research suggests that humans are not good at intuitively applying Bayes's theorem.⁶¹ Nonetheless, design detection based on probabilistic considerations is something humans do intuitively all the time.⁶² It is an open question how good human intuition is at detecting design. This is a question for experimental psychologists, whose experimental protocols will involve comparing the performance of humans at detecting design in various experimental setups with the performance of design detection criteria at detecting design.

8. ***Strong Irreducible Complexity of Functional Proteins and Protein Systems.*** Those who encounter molecular machines like the bacterial flagellum for the first time but have no prior commitment to Darwinism find it intuitively unconvincing that such systems can be explained in Darwinian terms. But those who have spent decades thinking of all complex cellular machinery in Darwinian terms will not arrive at this intuition just by being shown examples of systems they think they already understand. Hence, for biologists to be convinced that Darwinian explanations are inadequate, they will need to see *compelling new evidence* that Darwinian explanations of these systems really are inadequate. Recent research by Douglas Axe (see Appendix 3) provides such evidence in the form of a rigorous experimental assessment of the rarity of function-bearing protein sequences. By addressing this problem at the level of single protein molecules, this work provides an empirical basis for deeming functional proteins and systems of functional proteins to be unequivocally beyond Darwinian explanation.

9. ***Natural and Artificial Biological Design (Bioterrorist Genetic Engineering).*** We are on the cusp of a bioengineering revolution whose fallout is likely to include bioterrorism. Thus we can expect to see bioterror forensics emerge as a practical scientific discipline. How will such forensic experts distinguish the terrorists' biological designs from naturally occurring biological designs? Intelligent design and not contemporary evolutionary theory provides the theoretical frame for answering this question.

10. ***Design of the Environment and Ecological Fine-Tuning.*** The idea that ecosystems are fine-tuned to support a harmonious balance of plant and animal life is old. How does this balance come about? Is it the result of blind Darwinian material forces competing with one another and leading to a stable equilibrium? Or is there design built into such ecosystems? Can such ecosystems be improved

through conscious design or is “monkeying” with such systems invariably counterproductive? Intelligent design to become a significant voice in scientific debates over the environment.

11. ***Steganographic Layering of Biological Information.*** Steganography belongs to the field of digital data embedding technologies (DDET), which also include information hiding, steganalysis, watermarking, embedded data extraction, and digital data forensics. Steganography seeks efficient (high data rate) and robust (insensitive to common distortions) algorithms that can embed a high volume of hidden message bits within a cover message (typically imagery, video, or audio) without their presence being detected. Conversely, steganalysis seeks statistical tests that will detect the presence of steganography in a cover message. A key research question for intelligent design is to what degree do biological systems incorporate steganography, and if so, is biosteganography demonstrably designed?
12. ***Cosmological Fine-Tuning and Anthropic Coincidences.*** Although this is a well worn area of study, there are some new developments here that derive from a specifically design-theoretic perspective. Guillermo Gonzalez, assistant professor of physics and astronomy at Iowa State University, and Jay Richards, a senior fellow with Seattle’s Discovery Institute, have published *The Privileged Planet* in which they make a case for planet earth as intelligently designed not only for life but also for scientific discovery. In other words, they argue that our world is designed to facilitate scientific discovery of its own design. This work has been featured on the front cover of the October 2001 *Scientific American*. It connects intelligent design in biology to intelligent design in cosmology.
13. ***Astrobiology, SETI, and the Search for a General Biology.*** What might life on other planets look like? Is it realistic to think that there is life, and even conscious life, on other planets? What are the defining features that any material system must possess to be alive? How simple can a material system be and still be alive (John von Neumann posed this question over half a century ago in the context of cellular automata⁶³)? Insofar as such systems display intelligent behavior, must that intelligence be derived entirely from its material constitution or can it transcend yet nevertheless guide its behavior (cf. the mechanism vs. vitalism debate)? Is there a testable way to decide this last question? How, if at all, does quantum mechanics challenge a purely mechanistic conception of life? The intelligent design community is at the forefront in raising and answering such questions.
14. ***Consciousness, Free Will, and Mind-Brain Studies.*** Is conscious will an illusion—we think that we have acted freely and deliberately toward some end, but in fact our brain acted on its own and then deceived us into thinking that we acted deliberately. This is the majority position in the cognitive neuroscience community, and a recent book makes just that claim in its title: *The Illusion of Conscious Will* by Harvard psychologist Daniel Wegner.⁶⁴ But there is now growing evidence that consciousness is not reducible to material processes of the brain and that free will is

in fact real. Jeffrey Schwartz at UCLA along with quantum physicist Henry Stapp at the Lawrence Berkeley National Laboratory are two of the key researchers presently providing experimental and theoretical support for the irreducibility of mind to brain.⁶⁵

15. ***Autonomy vs. Guidance.*** Many scientists worry that intelligent design attempts to usurp nature's autonomy. But that is not the case. Intelligent design is attempting to restore a proper balance between nature's autonomy and teleologic guidance. Prior to the rise of modern science, all the emphasis was on teleologic guidance (typically in the form of divine design). Now the pendulum has swung to the opposite extreme, and all the emphasis is on nature's autonomy (an absolute autonomy that excludes design). Where is the point of balance that properly respects both, and in which design becomes empirically evident? The search for that balance-point needs always to be in the back of our minds as we engage in design-theoretic research. It's not all design or all nature but a synergy of the two. Unpacking that synergy is the intelligent design research program in a nutshell.

Appendix 5: W. A. Dembski's Testimony at Textbook Hearing (Exhibit)

Testimony for Textbook Hearing, Austin, Texas, September 10, 2003

<available at www.designinference.com after September 10, 2003>

My name is William Dembski. I'm an associate research professor in the conceptual foundations of science at Baylor University. I hold a Ph.D. in mathematics from the University of Chicago. One of the things I do for a living is study the probabilistic underpinnings of neo-Darwinian evolution.

In his testimony to you on July 9th, UT biology professor David Hillis claimed, "There is no debate about the existence of evolution in scientific circles." That may be, depending on how you define evolution. But there is considerable debate in scientific circles about the *mechanism* of evolution, namely, how it happened. Cambridge paleontologist Simon Conway Morris, writing for the premier biology journal *Cell*, remarks: "When discussing organic evolution the only point of agreement seems to be: 'It happened.' Thereafter, there is little consensus...." (Jan. 7, 2000)

Despite that, the illusion of scientific consensus is all we get in the textbooks. What's more, pro-Darwinian lobbyists, like Eugenie Scott, strive to maintain that illusion. In an interview with *Salon* (May 4, 2001), Scott tells us why. According to her, for textbooks to admit the lack of consensus over how evolution happened will "confuse kids about the soundness of evolution as a science."

Whatever happened to science education nurturing the capacity of young minds for critical thought? Whatever happened to exposing students to as much information as required to form balanced scientific judgments? All the textbooks under consideration grossly exaggerate the evidence for neo-Darwinian evolution, pretending that its mechanism of natural selection acting on random genetic change is a slam-dunk. Not so.

As a probability theorist, I, and many other mathematically-trained scientists, regard claims for the creative power of natural selection as implausible in the extreme. To see why, MIT's Murray Eden asks us to imagine a library evolving from a single phrase: "Begin with a meaningful phrase, retype it with a few mistakes, make it longer by adding letters, and rearrange subsequences in the string of letters; then examine the result to see if the new phrase is meaningful. Repeat until the library is complete." (Wistar Symposium, p. 110) From the standpoint of probability, neo-Darwinism is even more absurd.

Mathematicians aren't the only ones criticizing neo-Darwinism. Consider Franklin Harold, a professor emeritus of cell biology at Colorado State University. In 2001 he published *The Way of the Cell* with Oxford University Press. He remarked: "There are presently no detailed Darwinian accounts of the evolution of any biochemical or cellular system, only a variety of wishful speculations." (p. 205)

Last year I debated Brown University biologist Kenneth Miller, the lead author for one of the biology textbooks under consideration here (Fourth World Skeptics Conference, June 21, 2002). At that debate I read Harold's criticism. Miller didn't dispute the truth of Harold's statement, but merely made the irrelevant observation that Harold had retired fifteen years earlier. Sadly, such failures to address meaningful criticism of neo-Darwinian theory also pervade Miller's textbook and the others under consideration.

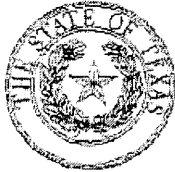
In his July testimony David Hillis implored you to "ignore the push to take the science out of our school science textbooks." Hillis missed the point entirely. The point is to put *more* science into our textbooks by including not only the strengths but also the weaknesses of neo-Darwinian evolutionary theory. Don't believe for one moment that all meaningful scientific debate about biological evolution has ceased or that it is only about loose ends and trivial details. If that were the case, none of us would be here today.

Appendix 6: Eugenie Scott on Peer Review (Exhibit)

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FAX COVER SHEET

To: Terri Lee
cc Joe Lee Fax: 281-877-9402
From: Gail Lowe Fax: 512-556-3278
Re: Eugenie Scott - peer-reviewed literature

Message: Three pages to follow -
Let me know if you need
something else.
Gail

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From-

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September 30, 2003

Stanley L. Weinberg, *Founder*

Dear Ms. Lowe,

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Mary Jane West-Eberhard, *Smithsonian*
Tim D. White, *UC Berkeley*

The Texas Freedom Network (TFN) received a request from one of the members of the Texas State Board of Education for a definition of the term "peer reviewed journal" and an analysis of whether Discovery Institute personnel publish in such journals. Because NCSE is an organization of scientists and teachers, TFN requested we prepare a brief essay responding to this board member's question.

Thinking that this information might be useful to other members of the SBoE, I have taken the liberty of sending it to you as well.

I hope you will not hesitate to contact me if you have any questions about this issue. The National Center for Science Education is a clearinghouse for information on the creationism/evolution controversy, and for over twenty years has provided information to scientists, teachers, parents and other citizens, as well as school boards.

Sincerely yours



Eugenie C. Scott, Ph.D.
Executive Director, NCSE

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Executive Director

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1. What constitutes a scientific peer-reviewed journal?

Peer-reviewed scientific research articles are the articles that actually report the experiments, measurements, calculations, and so forth that scientists make. They are often formidably technical, impersonal, and dry; they are written by working research scientists for other working research scientists in the same field. To say that a scientific article is peer-reviewed is to say that it has been evaluated by other scientists with a comparable knowledge of the field who ask: Is the writing style clear? Are the materials and methods explicitly stated, and in enough detail that another researcher would know how to try to reproduce the results? Does the paper show an understanding of previous results in the field? Does it add anything new to the body of scientific knowledge? And perhaps most importantly, do the results support the conclusions? The purpose of peer-review is not, as the Discovery Institute might like you to believe, to censor the scientific literature, but to ensure that there is scientific evidence for the claims made in it. Many more papers are submitted for publication than are printed; this is true both of mundane and cutting-edge research.

The system of peer review is not perfect, of course. There are worthy papers that fail peer-review (but usually their authors can find another journal in which to publish); there are unworthy papers that pass peer-review. For all its faults, however, the system is the best we have. The Discovery Institute is fond of pointing out that *On the Origin of Species* was not peer-reviewed, which is true: the system of peer-review did not exist in 1859, and even today books are not generally thought of as part of the peer-reviewed scientific research literature. But this is irrelevant. What matters is that unlike today's antievolutionists, Darwin was working within the norms of the scientific community: he was already a well-respected scientist when he published the *Origin*, and he and Wallace presented a joint paper at the Linnean Society in 1858 on natural selection. But the DI doesn't want to play by the rules.

A peer-reviewed scientific journal is simply a scientific journal that uses peer-review (as described above) in its editorial decisions of which papers to publish. Some peer-reviewed scientific journals publish only peer-reviewed papers; some — including the two most prestigious journals, *Science* and *Nature* — publish other sorts of articles as well, such as letters to the editor, opinion pieces, book reviews, news pieces, and so on, but it's always clear which articles are the peer-reviewed scientific research articles and which aren't. (The DI is not always clear about this, however. Trisha Gura's article in *Nature*, item 9 in the DI bibliography of "44 peer-reviewed articles," appeared there under the rubric "News Feature," suggesting that it wasn't in fact peer-reviewed. That doesn't make it a bad article; in fact, since it's written more for the general reader than for the working research scientist, it's probably more useful for classrooms than most of the other publications in the bibliography!)

2. Has Discovery published scientific peer-reviewed papers?

There are, to be sure, scientists associated with the DI who publish in the peer-reviewed scientific research literature (e.g., Michael Behe, Scott Minnich, Henry Schaefer). But they are not publishing anything there that supports "intelligent design" or that casts doubt on evolution. Indeed, as far as we know, they are not even *submitting* any original research on "intelligent design" to the scientific journals, preferring instead to publish editorials, popular articles, and books. (Occasionally they publish articles in peer-reviewed journals in philosophy, rhetoric, or similar fields.) William Dembski told the *Chronicle of Higher Education*: "I've just gotten kind of blasé about submitting things to journals where you often wait two years to get things into print ... And I find I can actually get the turnaround faster by writing a book and getting the ideas expressed there. My books sell well. I get a royalty. And the material gets read more." (December 21, 2001).

Many of the books published by Fellows of the DI are published by popular and/or religious presses, whose major criterion for publication is whether there is a sufficient market to sell enough copies to make a profit. The Discovery Institute has reportedly been claiming that books like William

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Dembski's *The Design Inference* (Cambridge University Press, 1998) or *Darwinism, Design, and Public Education*, ed. John Angus Campbell and Stephen C. Meyer (Michigan State University Press, 2003) are peer-reviewed. They may have undergone a degree of editorial review; they did not undergo peer-review in the sense in which scientific research articles are peer-reviewed. Moreover, these are not books that present scientific research -- Dembski's book was published as a philosophy book, Campbell and Meyer's as a rhetoric book. To say, as DI Fellow Francis Beckwith has, that the DI includes "uncredentialed scholars whose works have been published by university press monographs and in peer-reviewed periodicals" is to evade the central question: are they publishing good science?

3. Does Discovery misquote real scientists?

At the outset, it is important to note that the charge is not one of misquotation. During the September hearing of the Texas BOE, Ms. Leo on several occasions contended that "the quotations are accurate." But of course the DI is capable of reproducing the words of scientists accurately. The charge is rather twofold: that the DI is choosing from all of the scientific literature only the articles that they think will support their position without any consideration of opposing scientific viewpoints in other articles and then taking quotations out of context in such a way as to distort the author's intended meaning. (These tactics are so common in the antievolutionist literature that they've received colloquial names: "cherry-picking" for the former, "quote-mining" for the latter.)

One flagrant example of quote-mining occurred during William Dembski's testimony before the Texas BOE. He said:

In an interview with Salon (May 4, 2001), Scott tells us why. According to her, for textbooks to admit the lack of consensus over how evolution happened will "confuse kids about the soundness of evolution as a science."

http://www.designinference.com/documents/2003.09.TSBoE_Testimony.pdf

He gets the words right but the meaning wrong. If you consult the Salon article in question at: <http://dir.salon.com/news/feature/2001/05/04/darwin/index.html?pn=2> you find that Eugenie C. Scott (NCSE's executive director) was not discussing textbooks but disclaimers stating that "evolution is just a theory." More importantly, contrary to what Dembski says, she was not discussing doubts about *how* evolution happened but rather doubts about *whether* evolution happened.

In that article, Scott did not deny that scientists avidly debate the "hows" of evolution; in fact, she has clearly and repeatedly stated that such topics are appropriate for the science classroom. But Dembski says, "According to her, for textbooks to admit the lack of consensus over how evolution happened will 'confuse kids about the soundness of evolution as a science.'" He thereby implies that Scott believes that textbooks should not discuss arguments about how evolution occurs, which she does not. Attributing ideas to people that they do not hold is considered either exceedingly poor scholarship or, worse, willful polemicizing.

Further examples of the DI's quote-mining are available on the NCSE web site at:

<http://www.ncseweb.org/article.asp?category=12>
 and at:

http://www.ncseweb.org/resources/articles/3878_analysis_of_the_discovery_inst_4_5_2002.asp

The latter document compiles the reactions of many of the scientists whose work was misrepresented in the DI's bibliography of 44 publications from the scientific literature. With few exceptions, the DI did not make clerical errors in reproducing statements from these articles. It was their selection of statements out of context -- the quote-mining -- that the authors protest, because such selection misrepresents the meaning of their articles.

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Appendix 7: W. A. Dembski's Response to Eugenie Scott (Exhibit)

Peer Review — Response to Eugenie Scott and the NCSE
By William A. Dembski
October 10, 2003

Eugenie Scott's letter of September 30, 2003 to members of the Texas State Board of Education purports to show that intelligent design research is not published in the peer-reviewed literature. But, in fact, Scott has purposely failed to disclose certain key items of information which demonstrate that intelligent design research is now part of the mainstream peer-reviewed scientific literature.

I can substantiate the charge that Scott has purposely failed to disclose key information in this regard. Scott and I have met at several conferences and debates, and we correspond typically a few times a year by email. Here is a paragraph from an email she sent me on December 3, 2002 (in context, Scott was disparaging my work on intelligent design because, so she claims, it has not been cited in the appropriate peer-reviewed literature):

"It would perhaps be more interesting (and something for you to take rather more pride in) if it were the case that the scientific, engineering, and mathematical applications of evolutionary algorithms, fuzzy logic and evolution, etc., referenced TDI or your other publications and criticisms. In a quick survey of a few of the more scholarly works, I didn't see any, but perhaps you or someone else might know of them."

The abbreviation "TDI" here refers to my book *The Design Inference* (more about this book in a moment because Scott disparages it also in her letter of September 30, 2003). Now, the fact is that this book has been cited in precisely the literature that Scott claims has ignored it. I pointed this out to her in an email dated December 6, 2002. Here is the key bibliographic reference, along with the annotation, that I sent her:

Chiu, D.K.Y. and Lui, T.H. Integrated use of multiple interdependent patterns for biomolecular sequence analysis. *International Journal of Fuzzy Systems*. Vol.4, No.3, Sept. 2002, pp.766–775.

The article begins:

"Detection of complex specified information is introduced to infer unknown underlying causes for observed patterns [10]. By complex information, it refers to information obtained from observed pattern or patterns that are highly improbable by random chance alone. We evaluate here the complex pattern corresponding to multiple observations of statistical interdependency such that they all deviate significantly from the prior or null hypothesis [8]. Such multiple interdependent patterns when consistently observed can be a powerful indication of common underlying causes. That is, detection of significant multiple interdependent patterns in a consistent way can lead to the discovery of possible new or hidden knowledge."

Reference number [10] here is to *The Design Inference*.

Not only does this article cite my work favorably, but it makes my work in *The Design Inference* the basis for the entire article. When I sent Scott this information by email, she never got back to me. Interestingly, though, she has since that exchange dropped a line of criticism that she had previously adopted, namely, she had claimed that intelligent design is unscientific because intelligent design research is not cited in the peer-reviewed scientific literature. There's no question that it is cited (and favorably at that) in the peer-reviewed scientific literature.

What about actual intelligent design research being published in the peer-reviewed scientific literature? Scott doesn't want to allow that my book *The Design Inference* properly belongs to this literature. In her letter of September 30, 2003, she remarks that this book "may have undergone a degree of editorial review" but it "did not undergo peer-review in the sense in which scientific research articles are peer-reviewed." She then adds that *The Design Inference* "does not present scientific research — Dembski's book was published as a philosophy book."

Every one of these remarks is false. What's more, their falsity is readily established. Editorial review refers to a book submitted to a publisher for which the editors, who are employees of the publisher and in the business of trying to acquire, produce, and market books that are profitable, decide whether or not to accept the book for publication. Editorial review may look to expert advice regarding the accuracy, merit, or originality of the book, but the decision to publish rests solely with the editors and publishers. Peer-review, on the other hand, refers to journal articles and academic monographs (these are articles that are too long to be published in a journal and which therefore appear in book form) that are submitted to referees who are experts in the topic being addressed and who must give a positive review of the article or monograph if it is to be published at all. *The Design Inference* went through peer-review and not merely editorial review.

To see this, it is enough to note that *The Design Inference* was published by Cambridge University Press as part of a Cambridge monograph series: *Cambridge Studies in Probability, Induction, and Decision Theory*. Scott doesn't point this out in her letter of September 30, 2003 because if she had, her claim that my book was editorially reviewed but not peer-reviewed would have instantly collapsed. Academic monograph series, like the Cambridge series that published my book, have an academic review board that is structured and functions identically to the review boards of academic journals. At the time of my book's publication, the review board for *Cambridge Studies in Probability, Induction, and Decision Theory* included members of the National Academy of Sciences as well as one Nobel laureate, John Harsanyi, who shared the prize in 1994 with John Nash, the protagonist in the film *A Beautiful Mind*. As it is, *The Design Inference* had to pass peer-review with three anonymous referees before Brian Skyrms, who heads the academic review board for this Cambridge series, would recommend it for publication to the Cambridge University Press editors in New York. Brian Skyrms is on the faculty of the University of California at Irvine and is a member of the National Academic of Sciences. It is easy enough to confirm what I'm saying here by contacting him [his email address is bskyrms@uci.edu]. Scott either got her facts wrong or never bothered to check them in the first place.

What about Scott's claim that *The Design Inference* "does not present scientific research — Dembski's book was published as a philosophy book." It is true that Cambridge University Press officially lists this book as a philosophy monograph. But why should how the book is listed by

its publisher be relevant to deciding whether it does or does not contain genuine scientific content? The Library of Congress Control Number (LCCN) for *The Design Inference* is QA279.D455. As any mathematician knows, QA refers to mathematics and the 270s refer to probability and statistics. Is Scott therefore willing to accept that *The Design Inference* does present scientific research after all because the Library of Congress treats it as a mathematical and statistical monograph rather than as a philosophical monograph?

How this book is listed is beside the point. I submit that the book makes a genuine contribution to the statistical literature, laying out in full technical detail a method of design detection applicable to biology. Scott can dispute this if she likes, but to do so she needs to engage the actual content of my book and not dismiss it simply because the publisher lists it one way or another. Also, it's worth noting that up until I pointed out to her that *The Design Inference* is cited in the peer-reviewed mathematical and biological literature, her main line of argument against the scientific merit of my work was that it wasn't being cited in the peer-reviewed scientific literature. As I showed above, this line of criticism is no longer tenable.

I have discussed at length Scott's treatment of my own work because this is where I'm best qualified to speak to the issue of peer review in relation to intelligent design. As for the other claims in her letter of September 30, 2003, let me offer three remarks:

- Seattle's Discovery Institute is only the tip of the iceberg for scientists who support intelligent design. Intelligent design research is being published in precisely the places Scott claims it is not being published [see Appendix 3]. Moreover, intelligent design has a developing research program. For more information on this, see the ID FAQ on my website: http://www.designinference.com/documents/2003.09.ID_FAQ.pdf [the relevant portion of this FAQ appears, in beefed-up form, in Appendix 4].
- Scott's charge that critics of Darwinian evolution, like me and my colleagues at the Discovery Institute, "misquote" or "quote-mine" the work of scientists has degenerated into a slogan. As a slogan, its effect is to shut down discussion before it can get started. Scientists have no special privileges over anyone else. If they say things that are false or inaccurate, they need to be called to account. Reasoned discourse in a free society demands that people, and that includes scientists, confront the record of their words. One can dispute what the words meant in context, but it is not enough merely to assert that the words were quoted out of context.
- Finally, in her letter of September 30, 2003, Scott objects to my use of a statement she made in an interview with *Salon*. According to her letter, I implied that "Scott believes that textbooks should not discuss arguments about how evolution occurs." She protests that she "was not discussing doubts about *how* evolution happened but rather doubts about *whether* evolution happened." (Emphasis hers.) But if she really believes that there are many views of how evolution occurred, why does she and her lobbying group the NCSE [National Center for Science Education] support only one view on how evolution occurred, namely, the neo-Darwinian view? Why, for instance, isn't she demanding that the biology textbooks describe the controversy between neo-Darwinists (like John Maynard Smith) and self-organizational theorists

(like Stuart Kauffman)? Neither disputes whether evolution has happened. Yet, the self-organizational theorists strongly dispute that the neo-Darwinian view adequately explains how evolution occurred. All the textbooks ignore the self-organizational challenge to neo-Darwinism. If Scott (and the NCSE) is such a champion of pluralism concerning how evolution happened, why isn't she pressing for the inclusion of self-organizational theory in the biology textbooks? Why do all her lobbying efforts promote neo-Darwinism as the only view appropriate for the textbooks of how evolution occurred? I submit it is because, as she said in her *Salon* interview, to do otherwise will only "confuse kids about the soundness of evolution as a science." In other words, to ensure that kids are not confused about *whether* evolution occurred, textbooks need to tell them only one story about *how* evolution occurred, namely, the neo-Darwinian story. This isn't education. It's indoctrination.

Appendix 8: Wall Street Journal on Peer Review (Exhibit)

The Branding of a Heretic

Are religious scientists unwelcome at the Smithsonian?

BY DAVID KLINGHOFFER

Wall Street Journal

Friday, January 28, 2005 12:01 a.m. EST

<http://www.opinionjournal.com/taste/?id=110006220>

The question of whether Intelligent Design (ID) may be presented to public-school students alongside neo-Darwinian evolution has roiled parents and teachers in various communities lately. Whether ID may be presented to adult scientific professionals is another question altogether but also controversial. It is now roiling the government-supported Smithsonian Institution, where one scientist has had his career all but ruined over it.

The scientist is Richard Sternberg, a research associate at the Smithsonian's National Museum of Natural History in Washington. The holder of two Ph.D.s in biology, Mr. Sternberg was until recently the managing editor of a nominally independent journal published at the museum, *Proceedings of the Biological Society of Washington*, where he exercised final editorial authority. The August issue included typical articles on taxonomical topics--e.g., on a new species of hermit crab. It also included an atypical article, "The Origin of Biological Information and the Higher Taxonomic Categories." Here was trouble.

The piece happened to be the first peer-reviewed article to appear in a technical biology journal laying out the evidential case for Intelligent Design. According to ID theory, certain features of living organisms--such as the miniature machines and complex circuits within cells--are better explained by an unspecified designing intelligence than by an undirected natural process like random mutation and natural selection.

Mr. Sternberg's editorship has since expired, as it was scheduled to anyway, but his future as a researcher is in jeopardy--and that he had not planned on at all. He has been penalized by the museum's Department of Zoology, his religious and political beliefs questioned. He now rests his hope for vindication on his complaint filed with the U.S. Office of Special Counsel (OSC) that he was subjected to discrimination on the basis of perceived religious beliefs. A museum spokesman confirms that the OSC is investigating. Says Mr. Sternberg: "I'm spending my time trying to figure out how to salvage a scientific career."

The offending review-essay was written by Stephen Meyer, who holds a Cambridge University doctorate in the philosophy of biology. In the

article, he cites biologists and paleontologists critical of certain aspects of Darwinism--mainstream scientists at places like the University of Chicago, Yale, Cambridge and Oxford. Mr. Meyer gathers the threads of their comments to make his own case. He points, for example, to the Cambrian explosion 530 million years ago, when between 19 and 34 animal phyla (body plans) sprang into existence. He argues that, relying on only the Darwinian mechanism, there was not enough time for the necessary genetic "information" to be generated. ID, he believes, offers a better explanation.

Whatever the article's ultimate merits--beyond the judgment of a layman--it was indeed subject to peer review, the gold standard of academic science. Not that such review saved Mr. Sternberg from infamy. Soon after the article appeared, Hans Sues--the museum's No. 2 senior scientist--denounced it to colleagues and then sent a widely forwarded e-mail calling it "unscientific garbage."

Meanwhile, the chairman of the Zoology Department, Jonathan Coddington, called Mr. Sternberg's supervisor. According to Mr. Sternberg's OSC complaint: "First, he asked whether Sternberg was a religious fundamentalist. She told him no. Coddington then asked if Sternberg was affiliated with or belonged to any religious organization. . . . He then asked where Sternberg stood politically; . . . he asked, 'Is he a right-winger? What is his political affiliation?' " The supervisor (who did not return my phone messages) recounted the conversation to Mr. Sternberg, who also quotes her observing: "There are Christians here, but they keep their heads down."

Worries about being perceived as "religious" spread at the museum. One curator, who generally confirmed the conversation when I spoke to him, told Mr. Sternberg about a gathering where he offered a Jewish prayer for a colleague about to retire. The curator fretted: "So now they're going to think that I'm a religious person, and that's not a good thing at the museum."

In October, as the OSC complaint recounts, Mr. Coddington told Mr. Sternberg to give up his office and turn in his keys to the departmental floor, thus denying him access to the specimen collections he needs. Mr. Sternberg was also assigned to the close oversight of a curator with whom he had professional disagreements unrelated to evolution. "I'm going to be straightforward with you," said Mr. Coddington, according to the complaint. "Yes, you are being singled out." Neither Mr. Coddington nor Mr. Sues returned repeated phone messages asking for their version of events.

Mr. Sternberg begged a friendly curator for alternative research space, and he still works at the museum. But many colleagues now ignore him when he greets them in the hall, and his office sits empty as "unclaimed space." Old colleagues at other institutions now refuse to work with him on publication projects, citing the Meyer episode.

The Biological Society of Washington released a vaguely ecclesiastical statement regretting its association with the article. It did not address its arguments but denied its orthodoxy, citing a resolution of the American Association for the Advancement of Science that defined ID as, by its very nature, unscientific.

It may or may not be, but surely the matter can be debated on scientific grounds, responded to with argument instead of invective and stigma. Note the circularity: Critics of ID have long argued that the theory was unscientific because it had not been put forward in a peer-reviewed scientific journal. Now that it has, they argue that it shouldn't have been because it's unscientific. They banish certain ideas from certain venues as if by holy writ, and brand heretics too. In any case, the heretic here is Mr. Meyer, a fellow at Seattle's Discovery Institute, not Mr. Sternberg, who isn't himself an advocate of Intelligent Design.

According to the OSC complaint, one museum specialist chided him by saying: "I think you are a religiously motivated person and you have dragged down the Proceedings because of your religiously motivated agenda." Definitely not, says Mr. Sternberg. He is a Catholic who attends Mass but notes: "I would call myself a believer with a lot of questions, about everything. I'm in the postmodern predicament."

Intelligent Design, in any event, is hardly a made-to-order prop for any particular religion. When the British atheist philosopher Antony Flew made news this winter by declaring that he had become a deist--a believer in an unbiblical "god of the philosophers" who takes no notice of our lives--he pointed to the plausibility of ID theory.

Darwinism, by contrast, is an essential ingredient in secularism, that aggressive, quasi-religious faith without a deity. The Sternberg case seems, in many ways, an instance of one religion persecuting a rival, demanding loyalty from anyone who enters one of its churches--like the National Museum of Natural History.

Mr. Klinghoffer, a columnist for the Jewish Forward, is the author of "Why the Jews Rejected Jesus," to be published by Doubleday in March.

Endnotes

¹Peter Slevin, "Battle on Teaching Evolution Sharpens," *Washington Post* (March 14, 2005): A1.

²Jakob Wolf, "What Kind of Revolution Is the Design Revolution?" *Metanexus* (May 12, 2004): available online at http://www.metanexus.net/metanexus_online/show_article.asp?8846 (last accessed March 15, 2005). See also Jakob Wolf's analysis of intelligent design titled *The Cry of the Rose: Intelligent Design in Nature and the Critique of Darwinism* (Copenhagen: ANIS Publishers, 2004). The original title in Danish reads *Rosens Råb: Intelligent Design I Naturen, Opgør Med Darwinismen*.

³See William A. Dembski, *No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence* (Lanham, Md.: Rowman and Littlefield, 2002), ch. 6.

⁴Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970).

⁵For the current view, see Philip Kearey and Frederick J. Vine, *Global Tectonics* (Oxford: Blackwell Sciences, 1996). For the former view, known as the geosynclinal theory, which was subsequently discarded, see Thomas H. Clark and Colin W. Stearn, *The Geological Evolution of North America* (New York: Ronald Press, 1960). On page 43, Clark and Stearn remark: "The geosynclinal theory is one of the great unifying principles in geology. In many ways its role in geology is similar to that of the theory of evolution, which serves to integrate the many branches of the biological sciences.... Just as the doctrine of evolution is universally accepted among biologists, so also the geosynclinal origin of the major mountain systems is an established principle in geology." The geosynclinal theory is now dead and buried.

⁶The fellows of the International Society for Complexity, Information, and Design are a case in point: <http://www.iscid.org/fellows.php> (last accessed March 15, 2005). Here is a list of internationally recognized scientists from around the globe, all of whom accept that intelligent design is a legitimate scientific theory.

⁷Stephen Jay Gould, *Ever Since Darwin: Reflections in Natural History* (New York: W. W. Norton 1977), 267.

⁸Richard Dawkins, *The Blind Watchmaker* (New York: Norton, 1986), 6.

⁹Peter Singer, *A Darwinian Left: Politics, Evolution, and Cooperation* (New Haven, Conn.: Yale University Press, 2000), 6.

¹⁰Compare my explicitly theological book *Intelligent Design: The Bridge between Science and Theology* (Downers Grove, Ill.: InterVarsity, 1999), published with a religious publisher, with my peer-reviewed research monograph *The Design Inference: Eliminating Chance through Small Probabilities* (Cambridge: Cambridge University Press, 1998), which appeared in *Cambridge Studies in Probability, Induction, and Decision Theory*.

¹¹David Lindley, *The End of Physics: The Myth of a Unified Theory* (New York: Basic Books, 1993).

¹²Michael Crichton, "Aliens Cause Global Warming," Caltech Michelin Lecture (January 17, 2003): available online at http://www.crichton-official.com/speeches/speeches_quote04.html (last accessed March 15, 2005).

¹³NASA funding of SETI ended in 1993. See <http://www.setileague.org/general/history.htm> (last accessed March 15, 2005).

¹⁴Two prominent SETI projects currently under way are Paul Davies's research with the Australian Centre for Astrobiology (<http://aca.mq.edu.au>, last accessed March 15, 2005) and the SETI@home project at the University of California at Berkeley (<http://setiathome.ssl.berkeley.edu>, last accessed March 15, 2005).

¹⁵See Dembski, *The Design Inference*, chs. 5 and 6 as well as the epilogue and Dembski, *No Free Lunch*, chs. 2 and 3. Note that in *The Design Inference*, the actual phrase *specified complexity* does not appear. There it is expressed as *specified improbability* or *specified events of small probability*. The two notions are logically equivalent.

¹⁶Carl Sagan, *Contact* (New York: Simon Schuster, 1985).

¹⁷Dembski, *The Design Inference*, chs. 1 and 2.

¹⁸See, for instance, William A. Dembski and Michael Ruse, eds., *Debating Design: From Darwin to DNA* (Cambridge: Cambridge University Press, 2004), pt. IV.

¹⁹For such design-theoretic arguments at the level of cosmology, see Guillermo Gonzalez and Jay Wesley Richards, *The Privileged Planet: How Our Place in the Cosmos Is Designed for Discovery* (Washington, D.C.: Regnery, 2004). For such design-theoretic arguments at the level of biology, see Michael Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 1996) as well as Dembski, *No Free Lunch*, ch. 5.

²⁰Two of the principal purveyors of this view in the United States are the Institute for Creation Research (www.icr.org) and Answers in Genesis (www.answersingenesis.org).

²¹See Phillip Johnson's essay "Evolution as Dogma: The Establishment of Naturalism" in William A. Dembski, ed., *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing* (Wilmington, Del.: ISI Books, 2004).

²²See Aristotle's *Physics* as well as his *Metaphysics* in *The Basic Works of Aristotle*, ed. R. McKeon (New York: Random House, 1941).

²³See the AP article "Famous Atheist Now Believes in God" (December 9, 2004): <http://abcnews.go.com/US/wireStory?id=315976> (last accessed March 25, 2005).

²⁴See the interview between Antony Flew and Gary Habermas at <http://www.biola.edu/antonyflew> (last accessed March 25, 2005).

²⁵See Robert Pennock's *Tower of Babel* (Cambridge, Mass.: MIT Press, 1999) and his edited collection *Intelligent Design Creationism and its Critics* (Cambridge, Mass.: MIT Press, 2001) as well as Barbara Forrest and Paul Gross's *Creationism's Trojan Horse: The Wedge of Intelligent Design* (Oxford: Oxford University Press, 2004). The identification of intelligent design with creationism is evident from the very titles of the two latter books.

²⁶Kenneth R. Miller, *Finding Darwin's God: A Scientist's Search for Common Ground between God and Evolution* (New York: HarperCollins, 1999), 226–232.

²⁷Frederick C. Crews, "Saving Us from Darwin, Part II," *The New York Review of Books* (October 18, 2001): available online at http://www.nybooks.com/articles/article-preview?article_id=14622 (last accessed March 25, 2005).

²⁸Quoted in Henry Margenau and Roy Varghese, eds., *Cosmos, Bios, and Theos* (LaSalle, Ill.: Open Court, 1992), 83.

²⁹Paul Davies, *The Cosmic Blueprint: New Discoveries in Nature's Creative Ability to Order the Universe* (New York: Simon and Schuster, 1988), 203.

³⁰Paul Davies, *Superforce: The Search for a Grand Unified Theory of Nature* (New York: Simon and Schuster, 1984), 243.

³¹See note 58.

³²Pierre Duhem, *To Save the Phenomena: An Essay on the Idea of Physical Theory from Plato to Galileo*, E. Dolan and C. Maschler, trans. (Chicago: University of Chicago Press, 1969).

³³Pierre Duhem, *The Aim and Structure of Physical Theory*, P. P. Wiener, trans. (Princeton: Princeton University Press, 1954).

³⁴Kuhn, *The Structure of Scientific Revolutions*, ch. 10.

³⁵In the sixth edition of Darwin's *Origin of Species*, there is exactly one diagram, namely, one that depicts the evolution of organisms as a gradually branching tree. See Charles Darwin, *The Origin of Species*, 6th ed. (London: John Murray, 1872), 90–91.

³⁶Stephen Jay Gould, "Evolution's Erratic Pace," *Natural History* 86(5) (May 1977): 12–16.

³⁷Niles Eldredge and Stephen Jay Gould, "Punctuated Equilibria: An Alternative to Phyletic Gradualism," 82–115 in *Models in Paleobiology*, ed. T. J. M. Schopf (San Francisco: Freeman, 1973).

³⁸Lynn Margulis and Dorion Sagan, *Acquiring Genomes: A Theory of the Origins of Species* (New York: Basic Books, 2002), 103.

³⁹Robert B. Laughlin, *A Different Universe: Reinventing Physics from the Bottom Down* (New York: Basic Books, 2005), 168–169.

⁴⁰Consider the following remark by Simon Conway Morris: “When discussing organic evolution the only point of agreement seems to be: ‘It happened.’ Thereafter, there is little consensus....” Quoted from his article “Evolution: Bringing Molecules into the Fold,” *Cell* 100 (January 7, 2000): 1–11.

⁴¹Criticism of intelligent design in the mainstream biological literature is now so extensive that I give only a few examples: R. H. Thornhill and D. W. Ussery, “A Classification of Possible Routes of Darwinian Evolution,” *Journal of Theoretical Biology* 203 (2000): 111–116. This paper presents a conceptual analysis of Michael Behe’s claim that irreducible complexity poses an obstacle to Darwinian evolution. Thomas D. Schneider, “Evolution of Biological Information,” *Nucleic Acids Research* 28(14) (2000): 2794–2799 and Richard E. Lenski, Charles Ofria, Robert T. Pennock, and Christoph Adami, “The Evolutionary Origin of Complex Features,” *Nature* 423 (May 8, 2003): 139–144. These last two papers offer computational simulations that are supposed to demonstrate Darwinian evolutionary pathways leading to irreducible complexity. Reviews of intelligent design books are also increasingly common in the biological literature. For instance, my book *No Free Lunch* received the following review in *Nature*: Brian Charlesworth, “Evolution by Design?” *Nature* 418 (July 11, 2002): 129.

⁴²Eugenie Scott, “‘Science and Religion’, ‘Christian Scholarship’, and ‘Theistic Science’: Some Comparisons,” *Reports of the National Center for Science Education* 18(2) (1998): 30–32. Available online at http://www.ncseweb.org/resources/articles/6149_science_and_religion_chris_3_1_1998.asp (last accessed March 29, 2005).

⁴³Jacket endorsement of William A. Dembski’s anthology *Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing* (Wilmington, Del.: ISI Books, 2004).

⁴⁴Larry Arnhart, *Darwinian Natural Right: The Biological Ethics of Human Nature* (Albany, N.Y.: State University of New York Press, 1998).

⁴⁵Arnhart made this point with special clarity at a several-day symposium devoted to intelligent design at Hillsdale College. The symposium was titled “The Debate over Intelligent Design” and took place November 10–13, 2002. For details, see <http://www.hillsdale.edu/ccs/2002/IntelligentDesign/default.htm> (last accessed March 28, 2005). Representing the Darwinian side at this symposium were Larry Arnhart, Michael Ruse, Mano Singham, and Niles Eldredge. Representing the intelligent design side at this symposium were Michael Behe, Jonathan Wells, and William Dembski.

⁴⁶Charles Darwin, *On the Origin of Species*, facsimile 1st ed. (1859; reprinted Cambridge, Mass.: Harvard University Press, 1964), 2.

⁴⁷See <http://www.whitehat.com.au/Australia/People/Bragg.asp> (last accessed March 28, 2005).

⁴⁸James A. Shapiro and Richard von Sternberg, “Why Repetitive DNA Is Essential to Genome Function,” *Biological Reviews* 80 (2005): 1–24.

⁴⁹Roy J. Britten, “Coding Sequences of Functioning Human Genes Derived Entirely from Mobile Element Sequences,” *Proceedings of the National Academy of Sciences* 101(48) (November 30, 2004): 16825–16830.

⁵⁰Email correspondence from David Raup addressed to me and dated July 18, 2001.

⁵¹Percival Davis and Dean Kenyon, *Of Pandas and People: The Central Question of Biological Origins*, 2nd ed. (Dallas: Haughton, 1993). The first edition was published in 1989.

⁵²See <http://www.fteonline.com> (last accessed March 29, 2005).

⁵³Chapters in the two editions are identical. Pagination is virtually identical. Illustrations are largely unchanged, though there are some exceptions. A few illustrations have been replaced (compare the illustrations on pages 36 and 37 in the two editions). Some have been added (see the illustrations on pages 142 and 143 in the second edition). And some have been deleted (for instance, the illustration on page 76 of the first edition). The glossary in the second

edition is considerably beefed up when compared to the first edition. As for sections within chapters, these are essentially identical until the last chapter, which is titled "Biochemical Similarities." At the end of that chapter, some sections in the first edition on molecular clocks were replaced in the second edition with some sections on the blood-clotting mechanism. Chapter endings in the second edition include endnotes whereas the first edition did not. Changes in the actual text between the two editions is minimal, focusing on clarifications and improvements.

⁵⁴Jonathan Wells, *Icons of Evolution: Why Much of What We Teach about Evolution Is Wrong* (Washington, D.C.: Regnery, 2000).

⁵⁵*Ibid.*, ch. 2 and appendix 1.

⁵⁶See Charles Thaxton, Walter Bradley, and Roger Olsen, *The Mystery of Life's Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984); Robert Shapiro, *Origins, A Skeptics Guide to the Creation of Life on Earth* (New York: Summit Books, 1986); Hubert Yockey, *Information Theory and Molecular Biology* (Cambridge: Cambridge University Press, 1992), chs. 8, 9, and 10; Gordon Mills and Dean Kenyon, "The RNA World: A Critique," *Origins & Design* 17(1) (1996): 9–14; and Paul Davies, *The Fifth Miracle: The Search for the Origin and Meaning of Life* (New York: Simon & Schuster, 1999). According to Davies (p. 17), we are "a very long way from comprehending" how life originated. "This gulf in understanding is not merely ignorance about certain technical details, it is a major conceptual lacuna.... My personal belief, for what it is worth, is that a fully satisfactory theory of the origin of life demands some radically new ideas."

⁵⁷Dan Vergano and Greg Toppo, "'Call to Arms' on Evolution," *USA Today* (March 23, 2005): available online at http://www.usatoday.com/news/education/2005-03-23-evolution_x.htm?POE=click-refer (last accessed March 29, 2005).

⁵⁸According to Fred Hoyle, one of the great theoretical astronomers of the twentieth century, "A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question." Quoted from Fred Hoyle, "The Universe: Past and Present Reflections," *Annual Reviews of Astronomy and Astrophysics* 20 (1982): 16. See also P. C. W. Davies, "Emergent Biological Principles and the Computational Properties of the Universe," *Complexity* 10(2) (2004): 11–15 as well as Guillermo Gonzalez, Donald Brownlee, and Peter Ward, "The Galactic Habitable Zone: Galactic Chemical Evolution," *Icarus* 152(1) (July 1, 2001): 185–200. The full design-theoretic implications of the latter article can be found in Gonzalez and Richards, *The Privileged Planet*.

⁵⁹Eldredge and Gould, "Punctuated Equilibria."

⁶⁰Daniel Kahneman, Paul Slovic, and Amos Tversky, ed., *Judgment under Uncertainty: Heuristics and Biases* (Cambridge: Cambridge University Press, 1982).

⁶¹*Ibid.* See especially the seminal articles in this collection that are jointly authored by Amos Tversky and Daniel Kahneman.

⁶²See Dembski, *The Design Inference*, chs. 1 and 2.

⁶³John von Neumann, *The Theory of Self-Reproducing Automata*, A. Burks, ed. (Urbana, Ill.: University of Illinois Press, 1966).

⁶⁴Daniel M. Wegner, *The Illusion of Conscious Will* (Cambridge, Mass.: MIT Press, 2002).

⁶⁵See Jeffrey Schwartz and Sharon Begley, *The Mind and the Brain: Neuroplasticity and the Power of Mental Force* (New York: HarperCollins, 2002).